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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/030,087	01/14/2002	Masahiro Hatakeyama	020018	4284

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EXAMINER	
JOHNSTON, PHILLIP A	
ART UNIT	**PAPER NUMBER**
2881	

DATE MAILED: 10/24/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/030,087	HATAKEYAMA ET AL.	
	Examiner	Art Unit	
	Phillip A Johnston	2881	

-- The MAILING DATE of this communication appears on the cover sh et with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-5 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-5 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

Detailed Action

Claims Rejection – 35 U.S.C. 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-5 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,311,701 to Chen .

Regarding Claims 1-3, Chen discloses an ion source that includes an RF-grounded sub-Debye neutralizer grid that is suitable for use in a plasma reactor and with an Oxygen plasma beam. The grid comprises an aluminum grid core that is RF-grounded. The grid core comprises a plurality of grid holes(as recited in Claim 1). The plasma reactor includes an RF generator 11, RF inductor 13, and RF window 14. Reference 15 is the primary plasma. The RF coil can be any convenient shape. Reference 17 is the RF accelerator Reference 16 is the capacitively coupled RF accelerator circuit that taps RF power off the RF coil. Reference 16 supplies the RF power to the RF accelerator to the potential Vb (t). The primary plasma diffuses through the super-Debye RF accelerator as shown by the arrows through reference 18. Also, reference 18 denotes the "surface" of the RF accelerator (the grid in Fig 6) which is Aa. This surface relates to the plasma by the natural plasma potential Vp (t). The diffusion leads to reference 19 which is a

quiescent plasma at the artificial plasma potential Vpa(t). Reference 110 is the sheath boundary of the quiescent plasma, from which, the plasma starts its acceleration. Reference 111 is the plasma beam. Just before reaching the top surface of the RF-grounded sub-Debye Debye neutralizer grid (denoted Ag of 115), the plasma beam 111 becomes fully accelerated becoming the completed plasma beam. The surface Ag of 115 relates to the plasma by the artificial plasma potential Vpa (t). Reference 112 is the RF-grounded sub-Debye neutralizer grid. Reference 114 shows a blow-up of a section of this grid. Reference 117 is the high aspect ratio hole of this grid. Reference 116 is the inner surface of the hole of this grid. After the point of 115, the plasma beam is completed and there is no more meaningful acceleration. On the surface of 116, the ions (e.g., O+ undergo surface neutralization by shallow angle elastic surface forward scattering, becoming the Hyperthermal neutrals (e.g., O*, after surface neutralization). Reference 113 is the Hyperthermal Neutral Beam (e.g., O-beam). See Column 6, line 7-43. It is well known in the art to apply the same potential to the "beam emitting electrode and the chamber into which the beam is emitted", as recited in Claim 2, to reduce field distortion due to such differences in potential. It is also implied herein that the limitation of " two electrodes on the downstream end are separated by a distance of 5 millimeters or greater", as recited in Claim 3, is a common design choice based upon the voltages being applied to the electrodes.

Regarding Claim 4, Chen, as applied to Claims 1-3 above, disclosed an ion source that includes an RF-grounded sub-Debye neutralizer grid that is suitable for use in a plasma

reactor and with an Oxygen plasma beam. Chen also teaches that the grid holes in the grid core can be manufactured by micro-machining, or mechanical drilling, and at the peak ion cycle of the RF source, the grid qualifies as a sub-Debye grid where d is the grid hole diameter. In the Oxygen plasma beam example, d is 0.005", and the hole length is 0.062" (high aspect ratio: 62/5), as recited in Claim 4. See Column 9, line 9-25, and Figure 4.

Regarding Claim 5, Chen, as applied to Claims 1-4 above, disclosed an ion source that includes an RF-grounded sub-Debye neutralizer grid that is suitable for use in a plasma reactor and with an Oxygen plasma beam. Chen further discloses that utilizing the RF accelerator method, for the example of Hyperthermal O-beam, the completed plasma beam pulses at the used RF frequency, for example, at 13.56 Mhz, the electron cycle (negative cycle) generally lasts around .about.5 ns. During which, electrons coat the grid surface. The immediate ion cycle (positive cycle) generally lasts around, about 65 ns. During which, a constrained amount of ions, exactly equal in number to the earlier electrons (due to the capacitively coupled RF accelerator method), are burst out. These ions of the completed plasma beam enter the grid holes. A vast majority of them graze the inner surface of the holes. The interaction is a surface neutralization by shallow angle elastic surface forward scattering. This particular surface neutralization action neutralizes the ions. O* forms the initial Hyperthermal O-beam which propagates at the same energy as the completed plasma beam due to the surface elastic forward scattering process. See Column 4, line 18-44, and Figure 10.

Conclusion

4. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (703) 305-7022. The examiner can normally be reached on Monday-Friday from 8:00 am to 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor John Lee can be reached at (703) 308-4116. The fax phone numbers are (703) 308-2864 and (703) 308-7721.

PJ
October 11, 2002

JOHN R. LEE
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